



GRADE 12 DIPLOMA EXAMINATION

Mathematics 30

June 1987

Alberta
EDUCATION

CURRICULUM

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MATHEMATICS 30 MULTIPLE CHOICE KEY

- | | |
|-------|-------|
| 1. B | 27. D |
| 2. A | 28. B |
| 3. D | 29. C |
| 4. A | 30. C |
| 5. C | 31. C |
| 6. B | 32. B |
| 7. B | 33. A |
| 8. A | 34. B |
| 9. D | 35. C |
| 10. D | 36. C |
| 11. D | 37. D |
| 12. B | 38. A |
| 13. B | 39. C |
| 14. C | 40. A |
| 15. D | 41. C |
| 16. B | 42. D |
| 17. A | 43. A |
| 18. A | 44. A |
| 19. B | 45. A |
| 20. C | 46. C |
| 21. C | 47. C |
| 22. D | 48. C |
| 23. B | 49. D |
| 24. D | 50. B |
| 25. A | 51. D |
| 26. A | 52. D |

EXHIBIT TO REPORT OF THE

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| 1. | A |
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| 96. | B |
| 97. | B |
| 98. | B |
| 99. | B |
| 100. | B |

**GRADE 12 DIPLOMA EXAMINATION
MATHEMATICS 30**

DESCRIPTION

Time: 2½ hours

Total possible marks: 65

This is a **CLOSED-BOOK** examination consisting of two parts:

PART A: 52 multiple-choice questions each with a value of 1 mark.

PART B: Four written-response questions for a total of 13 marks.

A mathematics data booklet is provided for your reference. Approved calculators may be used.

GENERAL INSTRUCTIONS

Fill in the information on the answer sheet as directed by the examiner.

For multiple-choice questions, read each carefully and decide which of the choices **BEST** completes the statement or answers the question. Locate that question number on the answer sheet and fill in the space that corresponds to your choice. **USE AN HB PENCIL ONLY.**

Example

Answer Sheet

This examination is for the subject area of

A B C D

- A. Chemistry
- B. Biology
- C. Physics
- D. Mathematics

① ② ③ ●

If you wish to change an answer, please erase your first mark completely.

For written-response questions, read each carefully, show all your calculations, and write your answer in the space provided in the examination booklet.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work.

DO NOT FOLD EITHER THE ANSWER SHEET OR THE EXAMINATION BOOKLET.

The presiding examiner will collect the answer sheet and examination booklet for transmission to Alberta Education.

JUNE 1987

PART A


INSTRUCTIONS

There are 52 multiple-choice questions with a value of one mark each in this section of the examination. Use the separate answer sheet provided and follow the specific instructions given.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work.

WHEN YOU HAVE COMPLETED PART A, PROCEED DIRECTLY TO PART B.

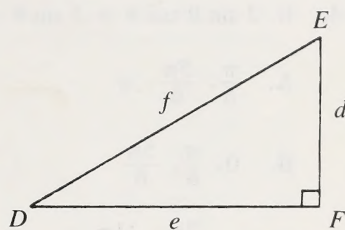
DO NOT TURN THE PAGE TO START THE EXAMINATION UNTIL TOLD TO DO SO BY THE PRESIDING EXAMINER.



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1. In the diagram to the right, $\tan E$ equals

- A. $\frac{e}{f}$
- B. $\frac{e}{d}$
- C. $\frac{d}{f}$
- D. $\frac{d}{e}$



2. A path on a unit circle with initial point $(1, 0)$ and length $-\frac{5\pi}{3}$, has a terminal point at

- A. $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
- B. $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$
- C. $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
- D. $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

3. If $\tan A$ and $\csc A$ are both negative, then

- A. $0 < A < \frac{\pi}{2}$
- B. $\frac{\pi}{2} < A < \pi$
- C. $\pi < A < \frac{3\pi}{2}$
- D. $\frac{3\pi}{2} < A < 2\pi$

4. If $2 \sin \theta \cos \theta + 2 \sin \theta = \cos \theta + 1$, $0 \leq \theta < 2\pi$, then θ is equal to

A. $\frac{\pi}{6}, \frac{5\pi}{6}, \pi$

B. $0, \frac{\pi}{6}, \frac{5\pi}{6}$

C. $\pi, \frac{7\pi}{6}, \frac{11\pi}{6}$

D. $0, \frac{7\pi}{6}, \frac{11\pi}{6}$

5. If $\tan \theta = \frac{5}{4}$ and $\pi < \theta < \frac{3\pi}{2}$, then $\cos \theta$ equals

A. $-\frac{3}{5}$

B. $-\frac{4}{5}$

C. $-\frac{4}{\sqrt{41}}$

D. $-\frac{5}{\sqrt{41}}$

6. The expression $\sec \theta \tan \theta \csc \theta \cos \theta$ is equal to

A. $\tan \theta$

B. $\sec \theta$

C. $\csc \theta$

D. $\cos \theta$

7. Which of the following is FALSE?

A. $\tan \pi = \frac{\sin(-\pi)}{-\cos \pi}$

B. $\sin\left(-\frac{\pi}{6}\right) = \sin\left(\frac{\pi}{6}\right)$

C. $\sin\left(\frac{\pi}{2} - \frac{\pi}{6}\right) = \cos\left(\frac{\pi}{6}\right)$

D. $\cos\left(\frac{\pi}{2} - \frac{\pi}{6}\right) = \sin\left(\frac{\pi}{6}\right)$

8. 105° in radian measure is approximately

A. 1.83

B. 2.44

C. 4.04

D. 5.38

9. The exact value of $\sin^2\left(\frac{7\pi}{6}\right) - 2\sin\left(\frac{7\pi}{6}\right)\cos\left(\frac{7\pi}{6}\right) + \cos^2\left(\frac{7\pi}{6}\right)$ is

A. $2 + \sqrt{3}$

B. $2 - \sqrt{3}$

C. $\frac{2 + \sqrt{3}}{2}$

D. $\frac{2 - \sqrt{3}}{2}$

10. In $\triangle PQR$, if $p = 10$ cm, $q = 8$ cm, and $r = 3$ cm, then $\angle R$ is approximately

A. 76°

B. 49°

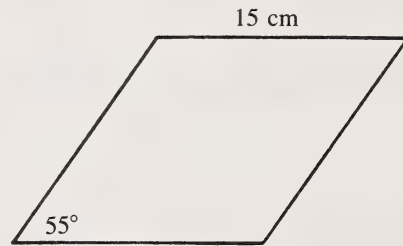
C. 41°

D. 14°

11. The angle between the two congruent sides of an isosceles triangle is 30° . If the side opposite this angle is 45 cm long, the perimeter of the triangle to the nearest centimetre is
- A. 92 cm
B. 155 cm
C. 201 cm
D. 219 cm
12. Two joggers running together reach a fork in the trail. The joggers take separate paths with the angle between the two paths being 26° . How far apart will the two joggers be after one runs 84 m down one path and the other runs 96 m down the other path, assuming the paths to be straight?
- A. 36.8 m
B. 42.1 m
C. 46.8 m
D. 127.6 m

13. The area of the rhombus shown at the right is approximately

- A. 225 cm^2
B. 184 cm^2
C. 92 cm^2
D. 60 cm^2



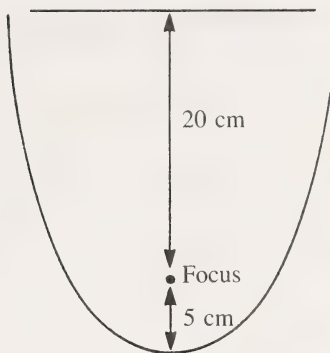
14. A circle with centre $(-3, 4)$ passes through the point $(-5, -1)$. The length of the radius is
- A. 29
B. 13
C. $\sqrt{29}$
D. $\sqrt{13}$

15. The centre and the radius of the circle defined by $x^2 + y^2 - 6x + 12y - 4 = 0$ are
- A. $(-3, 6), \sqrt{41}$
 - B. $(3, -6), \sqrt{41}$
 - C. $(-3, 6), 7$
 - D. $(3, -6), 7$
16. If a circle passes through the points $A(2, 5)$, $B(-5, 5)$, and $C(-5, -2)$, then the centre of the circle is in quadrant
- A. I
 - B. II
 - C. III
 - D. IV
17. For the parabola described by $x^2 + 6x - 12y + 21 = 0$, the focus is at
- A. $(-3, 4)$
 - B. $(-3, 1)$
 - C. $(3, -1)$
 - D. $(3, 2)$
18. The equation of a parabola with focus $(6, -4)$ and vertex $(3, -4)$ is
- A. $(y + 4)^2 = 12x - 36$
 - B. $(y - 4)^2 = -12x + 36$
 - C. $(x + 4)^2 = 12y - 36$
 - D. $(x - 4)^2 = -12y + 36$
19. A satellite receiving antenna is a parabolic dish. If the dish is 3 m in diameter and 0.5 m deep, the distance from the vertex to the focus is
- A. 4.50 m
 - B. 1.125 m
 - C. 0.50 m
 - D. 0.042 m

20. The line segment joining the vertices of an ellipse is called the
- A. locus
 - B. asymptote
 - C. major axis
 - D. minor axis
21. If the vertices of an ellipse are at $(\pm 6, 0)$ and one focus is at $(3, 0)$, the length of the minor axis is
- A. 54
 - B. $6\sqrt{5}$
 - C. $6\sqrt{3}$
 - D. 6
22. An ellipse with its centre at the origin has one focus at $(-5, 0)$ and one vertex at $(-10, 0)$. The equation of the ellipse is
- A. $\frac{x^2}{10} + \frac{y^2}{5} = 1$
 - B. $\frac{x^2}{20} + \frac{y^2}{10} = 1$
 - C. $\frac{x^2}{100} + \frac{y^2}{25} = 1$
 - D. $\frac{x^2}{100} + \frac{y^2}{75} = 1$

23. The diagram at the right represents a cross-section of a semi-elliptical drainage trough. An equation of the ellipse is

- A. $\frac{y^2}{400} + \frac{x^2}{225} = 1$
 B. $\frac{y^2}{625} + \frac{x^2}{225} = 1$
 C. $\frac{x^2}{400} + \frac{y^2}{25} = 1$
 D. $\frac{x^2}{625} + \frac{y^2}{25} = 1$

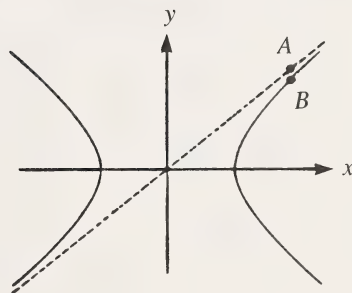


24. The equation $4x^2 - 9y^2 + 144 = 0$ defines

- A. a circle
 B. an ellipse
 C. a parabola
 D. a hyperbola

25. The hyperbola defined by $4x^2 - y^2 = 4$ is shown to the right. If $\frac{4}{2x + 2\sqrt{x^2 - 1}}$ represents the vertical distance from B on the hyperbola to A on the asymptote, then as x becomes infinitely large, $\frac{4}{2x + 2\sqrt{x^2 - 1}}$ approaches

- A. 0
 B. 1
 C. 4
 D. ∞



26. The end-points of the transverse axis of the hyperbola defined by $4x^2 - 9y^2 = 36$ are
- A. $(3, 0)$ and $(-3, 0)$
 B. $(0, 3)$ and $(0, -3)$
 C. $(2, 0)$ and $(-2, 0)$
 D. $(0, 2)$ and $(0, -2)$

27. An equation of a hyperbola with asymptotes $y = \pm \frac{3}{4}x$ is

A. $\frac{x^2}{3} - \frac{y^2}{4} = 1$

B. $\frac{x^2}{4} - \frac{y^2}{3} = 1$

C. $\frac{x^2}{9} - \frac{y^2}{4} = 1$

D. $\frac{x^2}{16} - \frac{y^2}{9} = 1$

28. If the n th term of an arithmetic series is $4n - 5$, then the sum of the first 12 terms is

A. 258

B. 252

C. 216

D. 43

29. If the sum of 5 terms of a geometric series is 61 and the common ratio is $-\frac{1}{3}$, then the first term is

A. $40\frac{1}{2}$

B. $45\frac{1}{2}$

C. 81

D. 162

30. A single deposit of \$1500 is made. If the interest rate is 6% per annum compounded semi-annually, the amount at the end of 12 years is

A. $\$1500(1.03)^{22} + \$1500(1.03)^{20} + \dots + \1500

B. $\$1500(1.06)^{11} + \$1500(1.06)^{10} + \dots + \1500

C. $\$1500(1.03)^{24}$

D. $\$1500(1.06)^{12}$

31. The expression $\sum_{n=6}^{15} (3n - 8)$ is equal to

A. 198

B. $211\frac{1}{2}$

C. 235

D. 240

32. The arithmetic series $10 + 13 + 16 + \dots + 61$ may be written as

A. $\sum_{n=3}^{61} (3n + 1)$

B. $\sum_{n=3}^{20} (3n + 1)$

C. $\sum_{n=1}^{61} (3n + 7)$

D. $\sum_{n=1}^{20} (3n + 7)$

33. The $\lim_{n \rightarrow \infty} \left(\frac{2n^2 - 1}{n^2 + 2} \right)$ is

A. 2

B. $\frac{1}{2}$

C. $\frac{1}{3}$

D. -1

34. If the sum of an infinite geometric series is 10 and the first term is 2, the common ratio is
- A. $\frac{6}{5}$
- B. $\frac{4}{5}$
- C. $-\frac{4}{5}$
- D. $-\frac{6}{5}$
35. The limit of the infinite sequence $\frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \dots, \frac{n}{2n+1}, \dots$ is
- A. 0
- B. $\frac{1}{3}$
- C. $\frac{1}{2}$
- D. 1
36. A rubber ball is dropped from a height of 81 m. If it rebounds $\frac{1}{3}$ of the distance it has fallen, then on the sixth rebound it will rise
- A. $\frac{1}{81}$ m
- B. $\frac{1}{27}$ m
- C. $\frac{1}{9}$ m
- D. $\frac{1}{3}$ m

37. Seven cars were fitted with Sureslip tires. The life of the tires in kilometres is as follows:

| Car | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------------|--------|--------|--------|--------|--------|--------|--------|
| Tire Life (km) | 22 400 | 19 200 | 19 200 | 22 400 | 22 400 | 17 600 | 22 400 |

The values of the mean, median, and mode respectively are

- A. 22 400 km, 22 400 km, 20 800 km
B. 22 400 km, 20 800 km, 22 400 km
C. 22 400 km, 22 400 km, 22 400 km
D. 20 800 km, 22 400 km, 22 400 km
38. If your z-score on a test is -1.6 , the mean of the test is 65, and your score on the test is 52, then the standard deviation (correct to two decimal places) for the test is
- A. 8.13
B. 1.28
C. 1.22
D. -8.13
39. A car battery normally has a mean life of 4 years with a standard deviation of 1 year. Of 500 batteries sold during one year, the number that is expected to last between 5 years and 6 years is
- A. 171
B. 80
C. 68
D. 10
40. A bag contains 4 red balls, 5 black balls, and 6 green balls. If one ball is drawn from the bag, the probability that it will be red or green is
- A. $\frac{2}{3}$
B. $\frac{2}{5}$
C. $\frac{1}{3}$
D. $\frac{1}{9}$

41. Brand X light bulbs have a mean life of 25 h with a standard deviation of 3 h. Assuming a normal distribution, the probability that a bulb will last between 22 h and 31 h is
- 0.95
 - 0.84
 - 0.82
 - 0.68
42. The life of a hairdryer heating element is normally distributed about a mean of 164 h with a standard deviation of 8 h. If the probability that a hairdryer will be returned under a manufacturer's guarantee is 0.08, for what length of time must the manufacturer guarantee the hairdryers?
- 175 h
 - 166 h
 - 162 h
 - 153 h
43. The expression $\frac{(m^{a+b})(m^{b+c})}{m^{-(a-c)}}$ is equivalent to
- m^{2a+2b}
 - m^{2b+2c}
 - m^{2a+b}
 - m^{2b}
44. The logarithmic form of $49^{\frac{1}{2}} = 7$ is
- $\log_{49}(7) = \frac{1}{2}$
 - $\log_7(49) = \frac{1}{2}$
 - $\log_{\frac{1}{2}}(7) = 49$
 - $\log_7\left(\frac{1}{2}\right) = 49$

45. If $\log_2(x) = 3$, then $\log_2(4x)$ is equal to
- A. 5
 - B. 12
 - C. 16
 - D. 32
46. In logarithmic form, the solution of $5^{x-3} = 50$ is
- A. $\log_{10}(50) - \log_{10}(5) + 3$
 - B. $\log_{10}(10) + 3$
 - C. $\frac{\log_{10}(50)}{\log_{10}(5)} + 3$
 - D. $\frac{\log_{10}(53)}{\log_{10}(5)}$
47. If $A = \frac{1}{2} h(a + b)$, then $\log(A)$ is equal to
- A. $\frac{1}{2} \log(h) + \log(a + b)$
 - B. $\frac{1}{2} \log(h) + \log(a) + \log(b)$
 - C. $\log(h) + \log(a + b) - \log(2)$
 - D. $\log(h) + \log(a) + \log(b) - \log(2)$

Use the following information to answer question 48.

Amount of an Investment

$$A = P(2.6)^{rt}, \text{ where } \begin{array}{l} A = \text{compound amount} \\ P = \text{initial investment} \\ r = \text{annual interest rate} \\ t = \text{time in years} \end{array}$$

48. If \$200 is invested at 10% per annum, in how many years will it amount to \$480?

- A. 6.5
- B. 9.0
- C. 9.2
- D. 10.5

49. A student uses synthetic division to divide $2x^3 - 4x^2 - x + 1$ by $x + 2$. If he bases his division on the configuration at the right, then the values of g and n respectively are

- A. 0 and 3
- B. 0 and -1
- C. -8 and 35
- D. -8 and -29

| | | | | |
|-----|---|-----|-----|-----|
| a | 2 | -4 | -1 | 1 |
| | | d | e | f |
| | 2 | g | h | n |

50. If $P(x) = 3x^3 + 2x^2 - x - 1$ is divided by $x + 2$, the remainder is

- A. -19
- B. -15
- C. 14
- D. 17

51. The equation $x^3 + 2x^2 - 14x - 3 = 0$ has

- A. 3 rational roots
- B. 3 irrational roots
- C. 1 irrational and 2 rational roots
- D. 1 rational and 2 irrational roots

52. If the zeros of a polynomial are $\frac{1}{2}$, $\frac{2}{3}$ and -1 , then the polynomial could be
- A. $6x^3 - x^2 + 5x - 2$
 - B. $6x^3 + x^2 - 5x + 2$
 - C. $6x^3 + x^2 - 5x - 2$
 - D. $6x^3 - x^2 - 5x + 2$

YOU HAVE NOW COMPLETED THE MULTIPLE-CHOICE SECTION OF THE EXAMINATION. PLEASE PROCEED TO THE NEXT PAGE AND ANSWER THE WRITTEN-RESPONSE QUESTIONS IN PART B.

PART B

INSTRUCTIONS

Please write your answers in the examination booklet as neatly as possible.

Show all pertinent calculations and formulas.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work.

TOTAL MARKS: 13

START PART B IMMEDIATELY

(3 marks)

1. An advertising sign 5 m in height is on top of a building. From an observer's position on the same level as the foot of the building, the angles of elevation to the top and bottom of the sign are 39° and 32° respectively. Determine to the nearest metre the height of the building.

2. a. In a school year of 180 days, the mean daily sales of french fries in the cafeteria yield a normal distribution with a mean of 50 kg and a standard deviation of 12 kg. Draw a normal distribution curve based on the above data and determine the number of days that the sales would be between 63 kg and 71 kg.

(4 marks)

-
- b. What is the probability that less than 35 kg will be sold on any one day?
-

(3 marks)

3. The first term of a geometric sequence is 7 and the common ratio is 2. If the middle term is 3584, find the number of terms in the sequence.

4. Determine the three x -intercepts of the graph of $y = 2x^3 - 7x^2 + 7x - 2$.

(3 marks)

**YOU HAVE NOW COMPLETED THE EXAMINATION. IF YOU HAVE TIME,
YOU MAY WISH TO GO BACK AND CHECK YOUR ANSWERS.**

(NO MARKS WILL BE GIVEN FOR WORK DONE ON THIS PAGE)

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GRADE 12 DIPLOMA EXAMINATIONS
MATHEMATICS 30 --

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